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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

INGHAM, JOHN C

ART UNIT

PAPER NUMBER

2814

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/521,879	<b>Applicant(s)</b> PARDO ET AL.	
	<b>Examiner</b> JOHN C. INGHAM	<b>Art Unit</b> 2814	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 04 November 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-10 and 12-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 12-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 January 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☒ Certified copies of the priority documents have been received in Application No. PCT/FR03/02343.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 112*

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claims **16-21** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

3. Regarding claims **16 and 17**, the claims recite that “the distance separating the first mirror from the second mirror is equal to or less than about 100 nanometers”, and more specifically “equal to or less than about 70 nanometers”. However, the specification discloses only an example wherein the distance separating the lower and upper mirrors may be 70 nanometers (pg 8). Therefore the specification does not enable one to produce a distance between lower and upper mirrors that is between 70 and 100 nanometers, or less than 70 nanometers. The claims have been interpreted as reciting that the distance separating the first mirror from the second mirror is equal to 70 nanometers.

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims **16-21** are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Regarding claims **16-20**, the language "equal to or less than about" is indefinite because the bounds of the claims can not be determined. For example, in claim 16, 101 nanometers is "about" 100 nanometers, but is not less than or equal to 100 nanometers. The claims have been interpreted with the word "about" removed.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims **1-3, 9-10, and 12-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Strittmatter (High-Frequency, Long Wavelength Resonant-Cavity-Enhanced InGaAs MSM Photodetectors) and Itatani (US 5,945,720).

10. Regarding claims **1-3, 9-10, and 12**, Strittmatter discloses in Fig 1 an MSM type photo-detection device (Introduction) designed to detect incident light and comprising reflecting means composed of a Bragg mirror (DBR layer InGaAlAs:Fe/InAlAs:Fe) superposed on a first face of a support (substrate) to form a first mirror for a Fabry-pérot type resonant cavity (Introduction), a layer of material that does not absorb said light (InAlAs), an active layer (absorbing layer) made of a semiconducting material (InGaAs:Fe) absorbing incident light and a network of polarization electrodes (interdigitated Pt/Au electrodes) collecting the detected signal, the electrodes network being arranged on the active layer, the electrodes network being composed of parallel conducting stripes at a uniform spacing (1.0µm), the electrodes network forming a second mirror for the resonant cavity (Introduction, page 146 ln 9, ln 22), wherein the light to be detected is incident onto the device through the electrodes network forming the second mirror (Fig 4 dashed line, frontside illumination, page 147 ln 23, ln 35 ln 42), the optical characteristics of this second mirror being determined by the geometric dimensions of said conducting strips, the distance separating the first mirror from the second mirror being determined to obtain a Fabry-perot type resonance (phase-matching between bottom mirror and metal electrodes, pg 146) for incident light between these two mirrors.

11. Strittmatter does not specify that the period of the electrodes is less than the wavelength of incident light ( $1.31\mu\text{m}$ ). Instead, Strittmatter discloses a period of  $1.8\mu\text{m}$ .

12. Itatani teaches that the smaller the width of the window between electrodes, the faster the operating speed of a photodetecting device (col 1 ln 45-50). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Itatani in the device of Strittmatter in order to increase the speed of the photodetector. The resulting structure would obviously have a shorter period that is less than the wavelength of incident light (Itatani col 1 ln 52, col 2 ln 13).

13. Regarding claims **13 and 14**, Strittmatter discloses in Fig 1 the photo-detection device according to claim 1 wherein a passive layer of silicon nitride is deposited on the electrode network (Fig 1, SiN phase matching layer).

14. Regarding claim **15**, Strittmatter discloses the device of claim 1, but does not specify wherein a second face of the support has an electrode to apply an electrical field to the device the change the resonant wavelength of the resonant cavity by the opto-electric effect.

15. Itatani discloses in Fig 7 wherein the support of the Fabry-Perot resonator structure has an additional control electrode (12) that allows the optical properties (absorption coefficient, refractive index) to be varied (col 10 ln 32-40). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Itatani on the device of Strittmatter in order to allow control of optical properties. Placement of the extra electrode on the top or bottom face of the support substrate would be an obvious design choice.

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16. Claims **4-6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Strittmatter, Itatani and Brown (US 5,663,639). Strittmatter and Itatani disclose the photo-detection device according to claim 1, but do not specify wherein the reflecting means forming a first mirror are composed of a silver, gold, or aluminum layer, or a multilayer dielectric. Instead Strittmatter discloses a Bragg mirror (DBR) of AlAs and AlGaAs.

Brown teaches in Fig 4 that a metallization layer (17) of gold may be used as a bottom reflecting layer in order to improve reflect photons and serve as a heat sink (col 7 ln 30-37). Brown also teaches in Fig 5 that instead of the metallic layer, a multilayer dielectric mirror (202) of AlAs and AlGaAs may be used, also to reflect photons and improve the conversion efficiency (col 7 ln 49-53). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Brown on the device of Strittmatter and Itatani in order to improve the conversion efficiency of the photo-detection device.

17. Claims **7-8** are rejected under 35 U.S.C. 103(a) as being unpatentable over Strittmatter, Itatani and Henning (US 6,528,827). Strittmatter and Itatani disclose the photo-detection device of claim 1, but do not specify wherein the layer of material that does not absorb light is made of  $\text{Al}_x\text{Ga}_{1-x}\text{As}$ , wherein  $x$  is of the order of 0.35, and the active layer is made of GaAs.

18. Henning teaches in Fig 6 that GaAs is typically used for active layers (104) to absorb light (col 4 ln 33), and layers of AlGaAs (106) with aluminum concentrations

around 0.3 (col 1n 4 ln 32) are used as transparent wide band-gap layers (col 2 ln 20-24) and buffers between high concentration layers and absorption layers (col 4 ln 33). It would have been obvious to one of ordinary skill in the art at the time of the invention to use the teachings of Henning on the device of Strittmatter and Itatani, providing a conventional GaAs absorbing (active) layer and a transparent wide band-gap layer of AlGaAs, functioning as a buffer between the DBR and absorbing layer while at the same time remaining transparent to light.

### ***Response to Arguments***

19. Applicant's arguments filed 1 August 2007 with regards to claims 1-10 and 12-15 have been fully considered but they are not persuasive.

20. Applicant argues that Strittmatter does not teach that light to be detected is incident onto the device through the electrodes network forming the second mirror. Strittmatter shows in Fig 4 that light is incident through the front (through the electrodes, wherein the top DBR is not deposited, see page 147 ln 20-24 and ln 42 ). Strittmatter also discloses that the cavity formed by the top mirror comprises the metallic portion of the top mirror, i.e. the interdigitated Pt/Au electrodes (page 146 ln 10, ln 22).

21. Regarding the argument that Strittmatter lacks motivation to illuminate the top mirror, Strittmatter directly discloses frontside illumination. Regarding the argument that Itatani would motivate reducing the space between electrodes and illuminating the device from the rear, Itatani teaches that space between electrodes is reduced and that



light is incident onto the electrodes (Fig 2 item I<sub>p</sub>), in similar fashion to the arrangement disclosed by Strittmatter.

### ***Conclusion***

22. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Yuang ("Effects of finger width on large-area InGaAs MSM photodetectors") discusses efficiency as related to finger width of the top electrodes. Yuang ("High-Responsivity InGaAs MSM Photodetectors with Semi-Transparent Schottky Contacts") discusses frontside illumination in MSM photodetectors.

23. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN C. INGHAM whose telephone number is (571)272-8793. The examiner can normally be reached on M-F, 8am-5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (571) 272-1705. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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